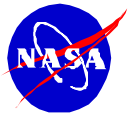
SPACE SHUTTLE PROGRAM
Space Shuttle Program Integration
NASA Johnson Space Center, Houston, Texas



STS-104 Flight Readiness Review

June 28, 2001

Agenda

- Program Integration - Flight Manager * — Nat Hardee
  - Key Program Considerations
  - Payload & System Safety
  - Orbital Debris Status
  - Payload In-Flight Anomalies — No Issues
  - Launch Commit Criteria * — No Issues
- USA Program Integration * — Bob White
- Boeing Integration
  - Program Anomalies — No Issues
  - Waivers to Vol X — No Issues
- System Integration TMR * — No Issues
- Flight Readiness Statement

* Backup Material Included

Key Program Considerations

- **All dynamic / deploy pinch points show acceptable positive clearance margins**
- **Late Middeck Manifest Changes**
  - **Baselined L-25 day ISS Program Requirements at 05/17 IPT**
    - **1st implementation of Lessons Learned process update**
    - **Reserve one 5 MLE bag & one locker (L-10 Bench Review and L-6 Stow)**
  - **PRCB CR S061702 approved 05/29, manifesting additional ISSP rqmts**
  - **PRCB CR S061702A approved 06/22, manifesting additional ISSP rqmts**
  - **Late EMU changes (locations and internal configurations) incorporated 06/22**
    - **Lessons Learned process corrective actions in work**
  - **CCCD / FCE-EVA / KSC FCE / Opts impacts incorporated to support changes**
    - **05/30 and 05/26 Delta Bench Review**

Payload and System Safety

- **Integrated Experiment Hazards Assessment Is Complete**
- **Toxicology Process**
  - **Verification 1: Complete**
  - **Verification 2: Standard open work for late load items**
- **Payload Safety Review Process Is Complete**

STS-104 Orbital Debris Status

- **Orbital Debris / Micrometeoroid Risk Is Acceptable**

Criteria	Risk	Guideline
Critical Penetration	1 in 563	1 in 200
Radiator Tube Penetration	1 in 2058	1 in 61
Window Replacements	35%	N/A

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USA PROGRAM INTEGRATION FLIGHT PREPARATION PROCESS

Presenter:
Bob White
Organization/Date:
Program Integ/06-28-2001

- **All the Systems and Cargo Integration flight preparation activities have been completed except for planned open work – no issues identified**
  - LCN in work to reflect increased purge rate impacts on MPS and Haz Gas LCC preplanned procedures
- **Completed tasks include:**
  - Verification of compliance with generically certified requirements
  - Mission specific analyses
  - Documentation of vehicle and cargo requirements
  - Reconfiguration / installation of Payload Integration hardware
  - Payload bay clearance assessment

Program Integration Is Ready to Support Flight

SHUTTLE SYSTEM IS CERTIFIED FOR BLOCK II SSME

Presenter:
Bob White
Organization/Date:
Program Integ/06-28-2001

- **The following areas were assessed for Block II**
  - Ascent Performance
  - ET Pressurization
  - Prelaunch Loads
  - Liftoff Loads
  - Ascent Flight Loads
  - Guidance, Navigation and Control
  - POGO
  - SSME Ignition Overpressure, Acoustics, and Sideloads
- **The following changes resulted from the Block II assessments**
  - Performance margin is reduced 240 lbs per Block II engine
  - Minimal expansion of ET ullage pressure ICD limits
  - RSRM Volume X ground wind exception resulted in revised LCC with a small reduction in allowable southeast ground wind

STS-104 IS A PHASED IMPLEMENTATION OF BLOCK II

Presenter:
Bob White
Organization/Date:
Program Integ/06-28-2001

- **STS-104 is the first Block II flight**
  - STS-104 is a mixed cluster configuration with one Block II in position 2 and two Block IIA's in positions 1 and 3
- **STS-104 mission specific verification was performed for the mixed cluster configuration**
  - GH_2 and GO_2 pressurization assessments within ICD limits
  - Liftoff loads assessment cleared all structural load indicators

All Assessments Complete – Results Within Limits

STS-104 Flight Readiness Statement

THIS CERTIFIES THAT ALL MISSION REQUIREMENTS HAVE BEEN MET AND SPACE SHUTTLE INTEGRATION IS READY FOR FLIGHT, PENDING COMPLETION OF THE DEFINED OPEN WORK

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STS-104 Flight Readiness Review

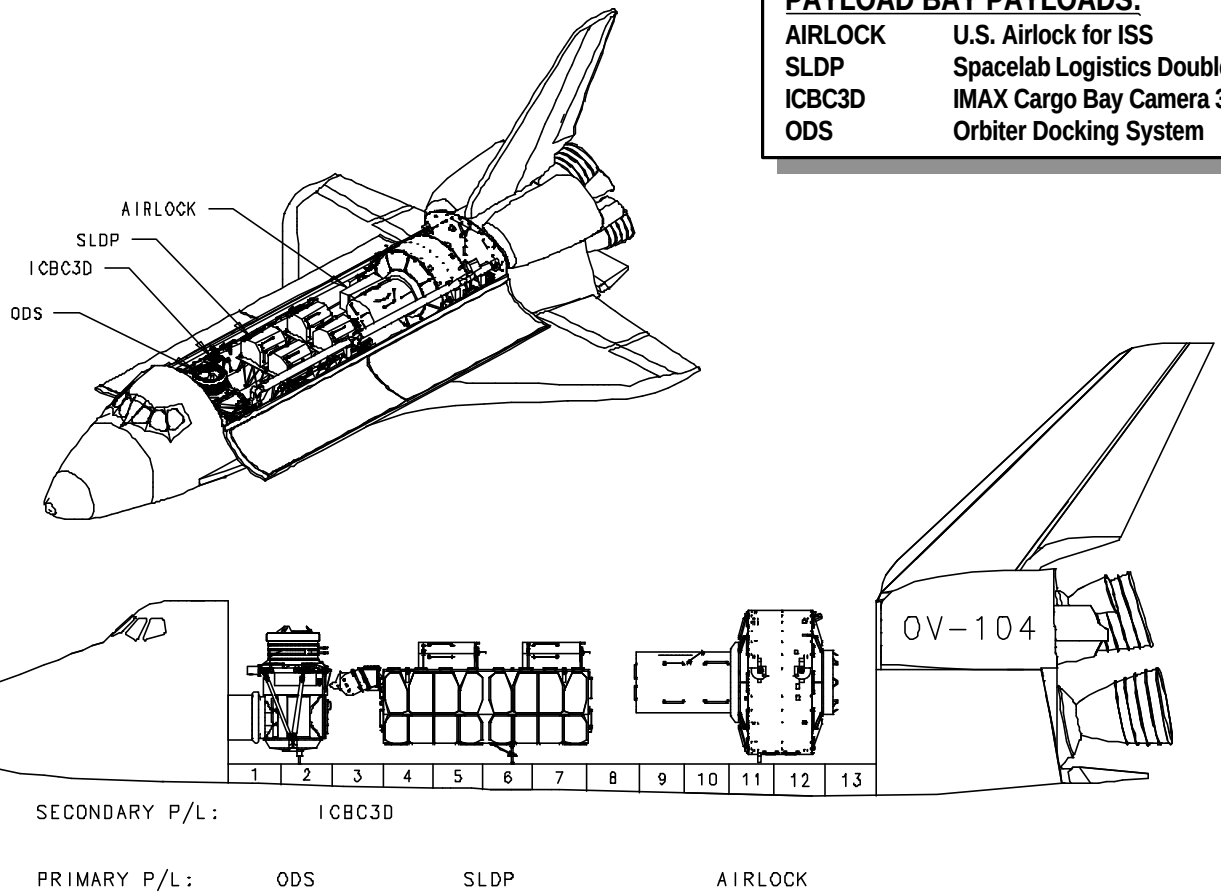
Backup Charts

STS-104 Cargo Bay Arrangement for Flight

Presenter Nat Hardee

PAYLOAD BAY PAYLOADS:

AIRLOCK	U.S. Airlock for ISS
SLDP	Spacelab Logistics Double Pallet
ICBC3D	IMAX Cargo Bay Camera 3 Dimension
ODS	Orbiter Docking System



STS-104 Development Test Objectives (DTO's)

DTO 261 International Space Station (ISS) On-Orbit Loads Validation

- Excite (using the Shuttle's aft Primary RCS jets) and measure the structural dynamics of the ISS (using photogrammetic, acceleration and dynamic strain measurements) and use the results to validate critical areas of the on-orbit loads prediction models

* DTO 262 On-Orbit Bicycle Ergometer Loads Measurement

- Study the possibility of reducing the engineering conservatism of bicycle ergometer pre-flight load predictions by measuring the joined Shuttle/ISS natural frequencies while using the bicycle ergometer as the natural frequency excitation source

* DTO 692 International Space Station Waste Collection Subsystem (WCS) Refurbishment

- Test and verify the ISS WCS zero-g specific design changes prior to permanent installation on the ISS

DTO 700-14 Single String Global Positioning System (No PGSC)

- Demonstrate performance of GPS using GPS receiver (MAGR-S) and existing GPS antennas
- Provides hardware interface (BFS), navigation linkage, and display capability
- Initial step in preparation for redundant three string GPS system on all orbiters and the associated removal of TACANS

DTO 805 Crosswind Landing Performance (DTO of Opportunity)

- Demonstrate the capability to perform a manually controlled landing in the presence of a crosswind

*** First Flight**

STS-104 Detailed Supplementary Objectives (DSO's)

DSO 493 Monitoring Latent Virus Reactivation and Shedding in Astronauts

- Determine the frequency of induced reactivation of herpes viruses, herpes virus shedding, and clinical disease after exposure to the physical, physiological, and psychological stresses associated with space flight

DSO 496 Individual Susceptibility to Post-Spaceflight Orthostatic Intolerance (Pre- & Post-flight only)

- Perform a flight related study of the occurrence of postflight orthostatic hypotension in some, but not all astronauts

DSO 498 Space Flight and Immune Functions (Pre- & Post-flight only)

- Characterize the effects of space flight on selected immune elements that are important in maintaining an effective defense against infectious agents

* DSO 634 Sleep-Wake Actigraphy and Light Exposure During Spaceflight

- Monitor sleep-wake activity and light exposure patterns obtained in-flight to help better understand the effects of space flight on sleep as well as aid in the development of effective countermeasures for both short and long-duration spaceflight

* DSO 635 Spatial Reorientation Following Space Flight (Pre- & Post-flight only)

- Examine the adaptive changes of spatial orientation (from a gravitational frame-of-reference to an internal, head-centered frame-of-reference) that occurs during adaptation to microgravity and is reversed during the first few days after return to Earth
- Demonstrate the degree to which challenging motion environments may affect postflight (re)adaptation and lead to a better understanding of safe postflight activity regimens

*** First Flight**

HTD 1403 Micro-Wireless Instrumentation System (Micro-WIS)

- Demonstrate the operational utility and functionality of Micro-WIS on-orbit, initially in the crew cabin of the Shuttle Orbiter and then in the International Space Station
- The 1" diameter Micro-WIS is a system of autonomous, micro-sized/weight temperature sensors for data acquisition

Launch Commit Criteria Changes for STS-104

- **MPS-40 and HAZ-02 LCC Changes Due to Block II Engines**
  - **SSME Project requests that there be no interruption of Helium purge on the first flight of Block II Engines**
  - **MPS-40 Preplanned Procedure was rewritten to not require purge interruption to generate delta P for troubleshooting**
  - **HAZ-02 Preplanned procedure would require interruption of Helium purge on Block II Engine. This change results in a No-Go condition should purge interruption be required for troubleshooting**
  - **Approval expected 07/03/01**
- **Generic Ground Wind Update Due to Block II SSME**
  - **Updates the maximum allowable surface wind limits. Requirements for flights with one or more Block II SSME's are constrained by RSRM case buckling concerns. All Block IIA flights retain limits derived from the formula in the current NSTS 07700, Vol X**

Launch Commit Criteria Changes for STS-104

- **Block II SSME HPFT Discharge Temperature LCC Changes**
  - Adds requirements for Block II engines which have lower fuel turbopump discharge temperatures. Eliminates the 23 of 24 requirements for transducers prior to T-5 minutes and reverts to 3 of 4 transducers required per turbopump
- **Minimum Equipment List (MEL) Mission Specific**
- **ICE-FG01 No Ice Zone Update**
  - Updates the No Ice Zone figure to explicitly state locations of the various permissible ice zones on the ET
- **GNC LCC Updates**
  - Updates GNC SSID's to eliminate references to obsolete equipment, and more explicit procedures, and correct misidentified MSID descriptors
  - Makes all Body Flap Position Feedback transducers mandatory since they are directly in the flight control loop

STS-104 NASA System Integration TMR Flight Readiness

- Insight, audit and surveillance requirements complete
- No out-of-family problems have been identified for impact to safety of flight, or planned flight operations
- Approved Program requirements changes have been implemented and verified
  - ICD, OMRS, LCC
  - Vehicle configuration
  - DOSS configuration
  - NSTS 07700, Volume X
  - Joint requirements
- All Joint Shuttle / International Space Station on-orbit Systems Integration analyses have been completed and compatibility verified for STS-104-7A baseline mission
- System Integration is ready for flight pending the completion of remaining open work